A Neat Methodology for Microprocessor Upset Testing

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Outline

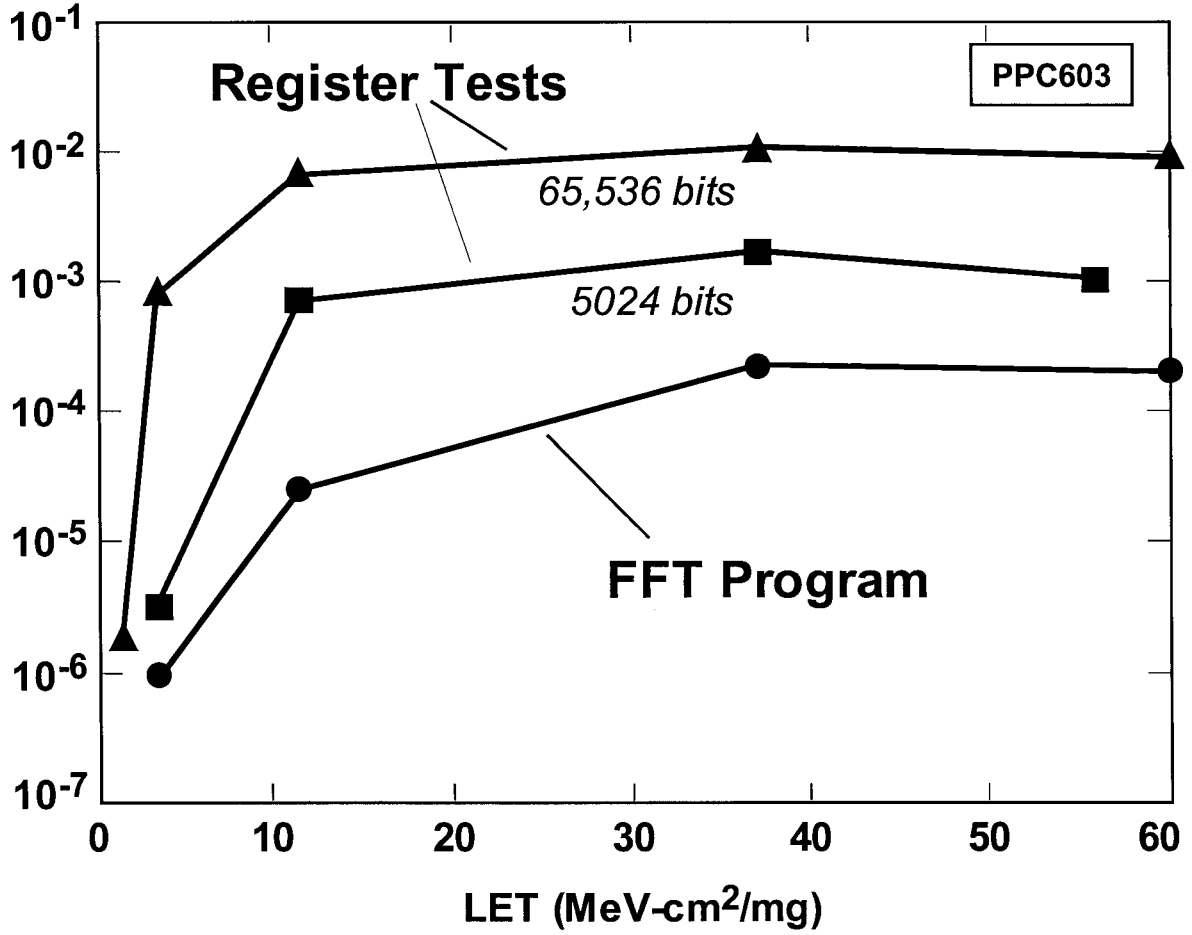
I. Register Tests vs. Application Tests

II. “Pin Wiggler” methodology

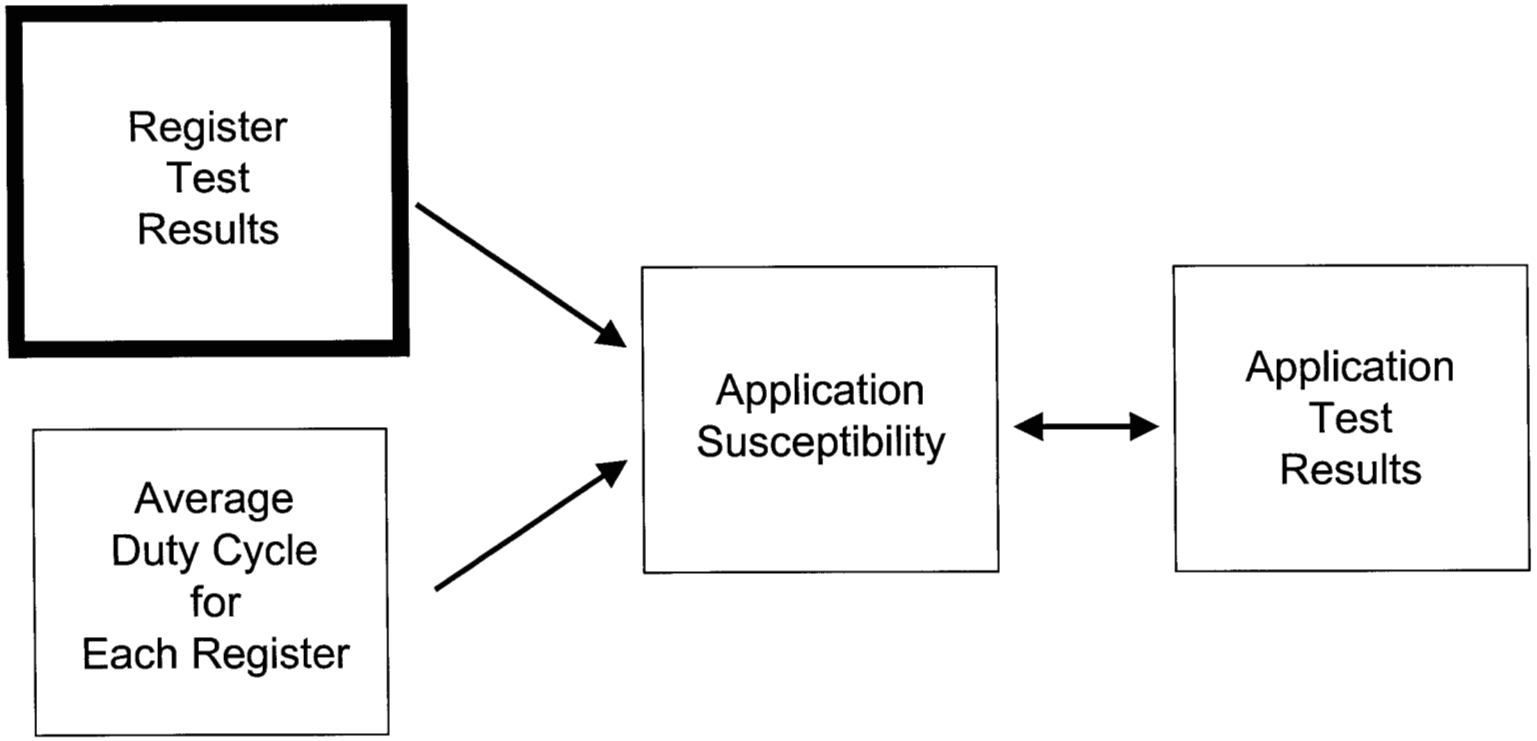
III. Example results: 2 microcontrollers

IV. Conclusion

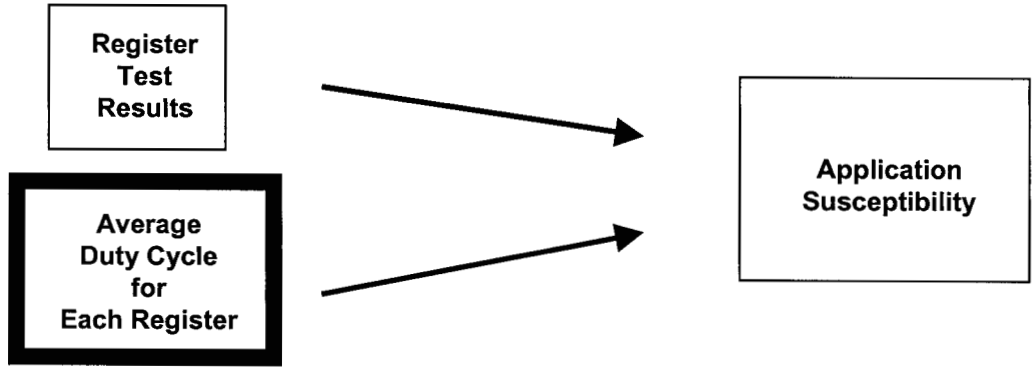
Register Testing versus Application Testing

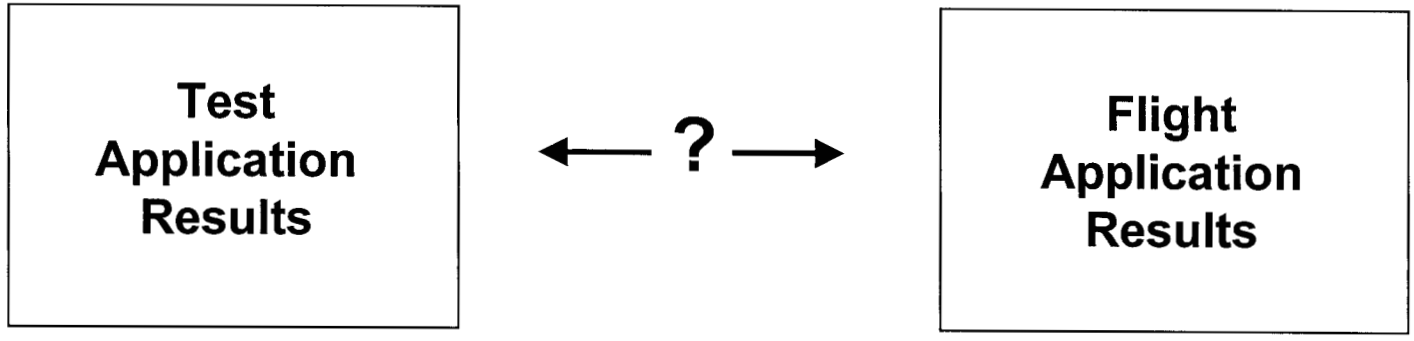


Register Testing Yields "Fundamental" Information

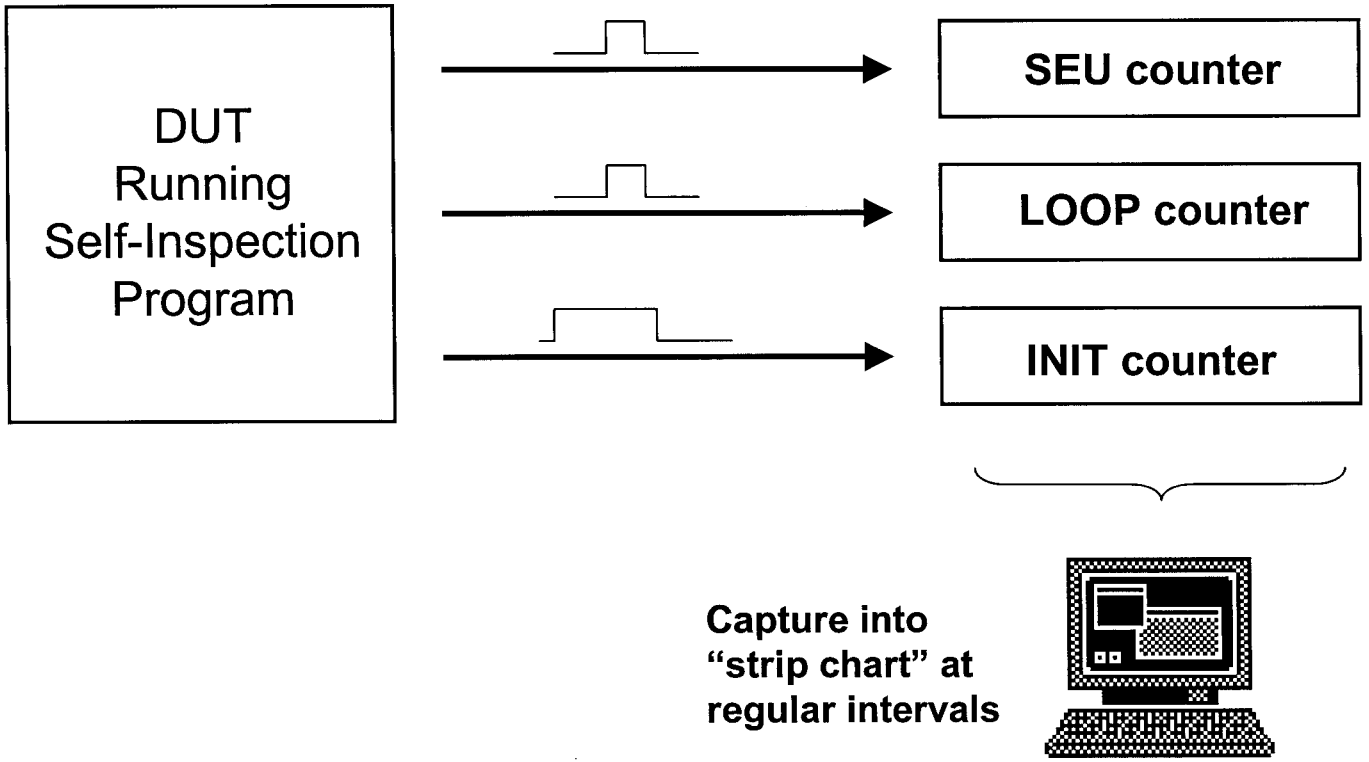


Calculation Of Space Upset Rates



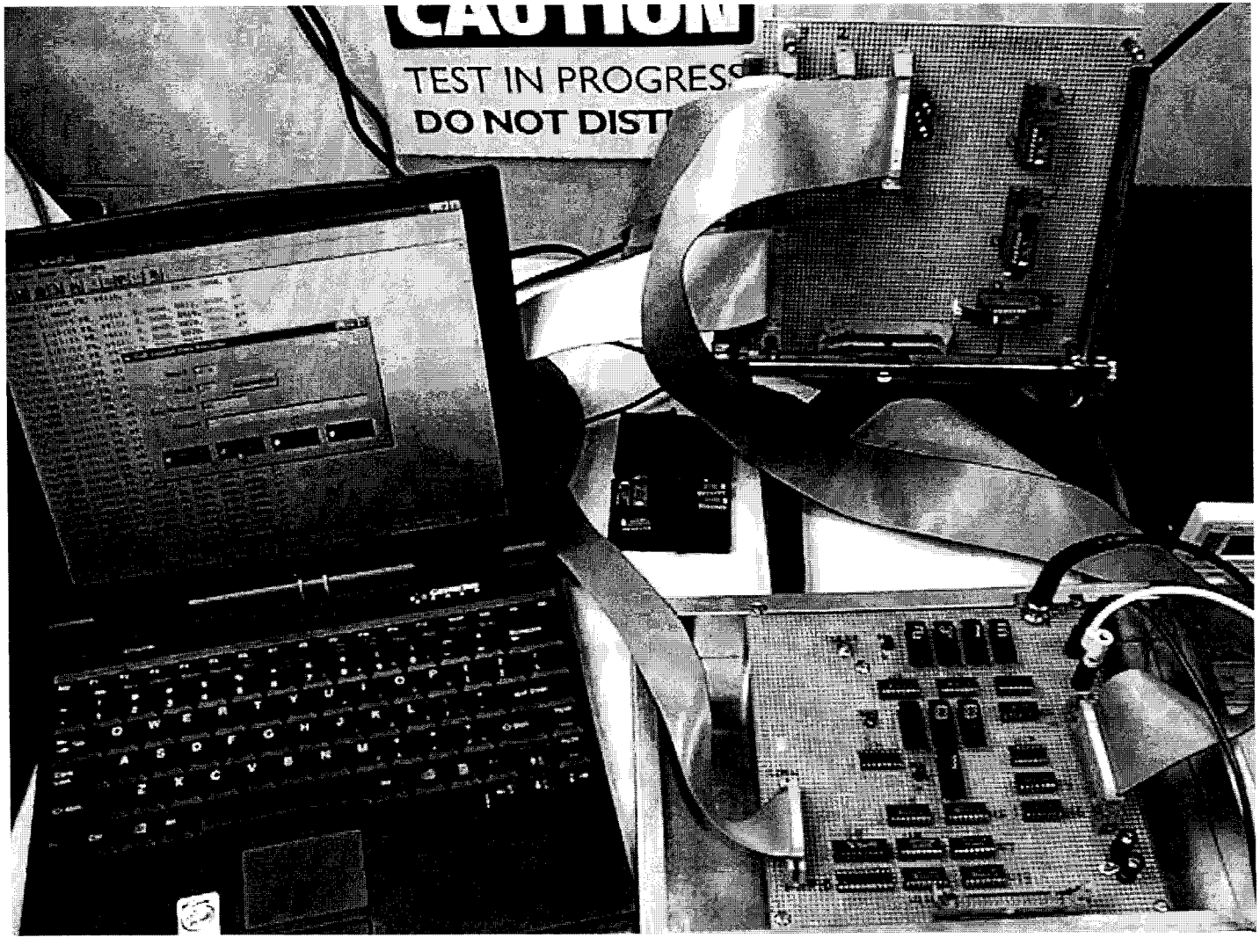


"Pin Wiggler" Method For Register Testing

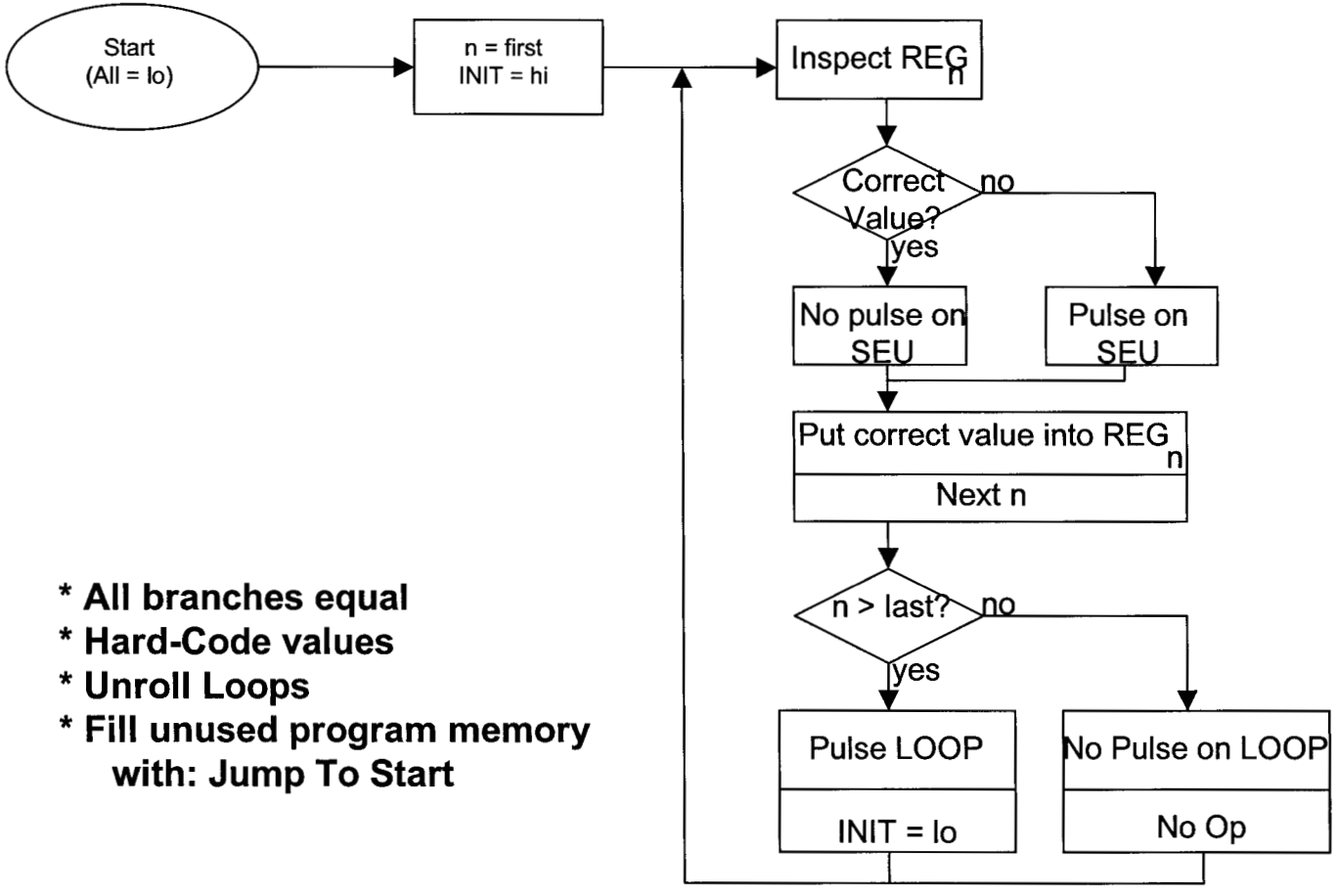


JPL

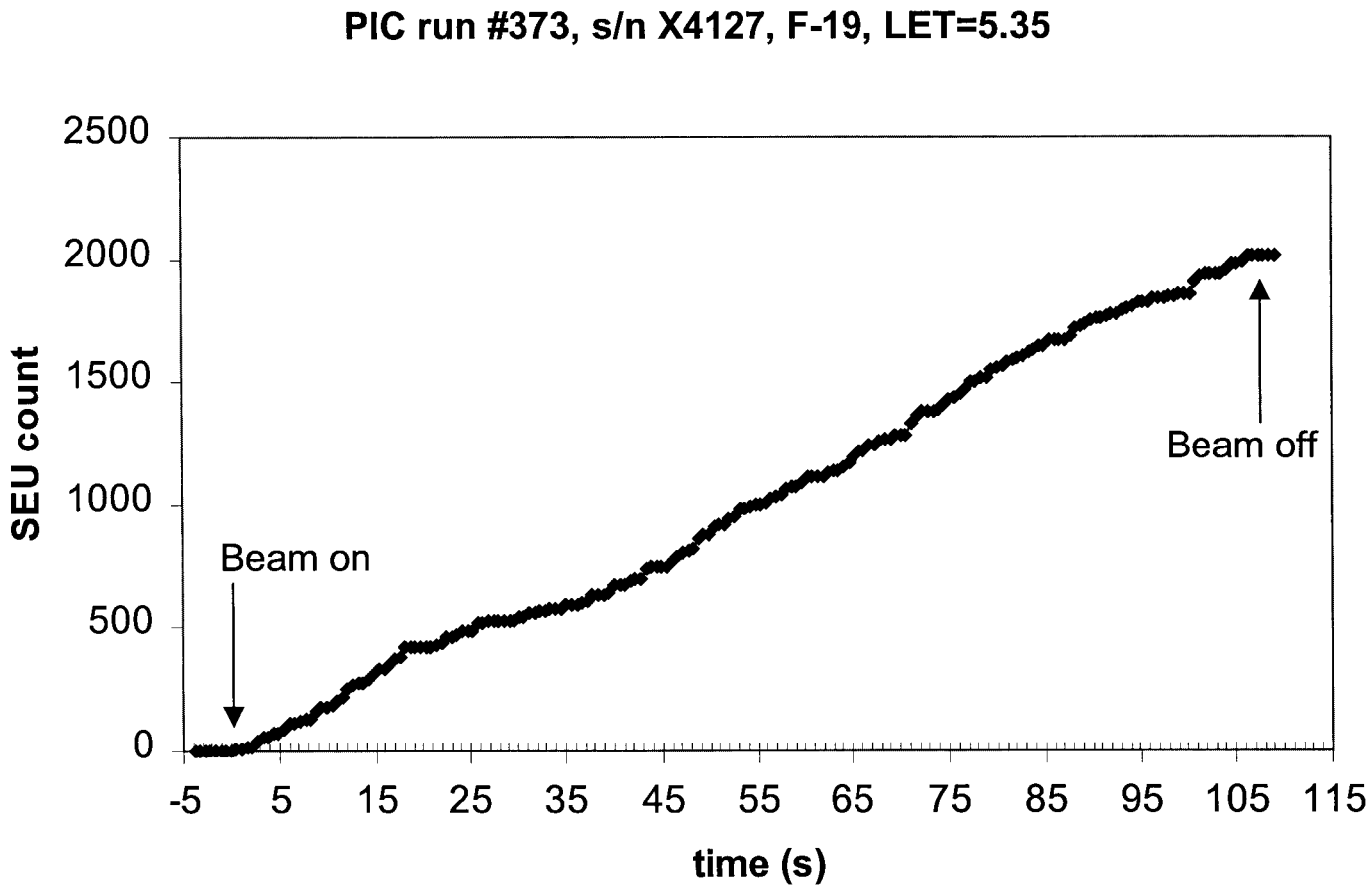
JPL



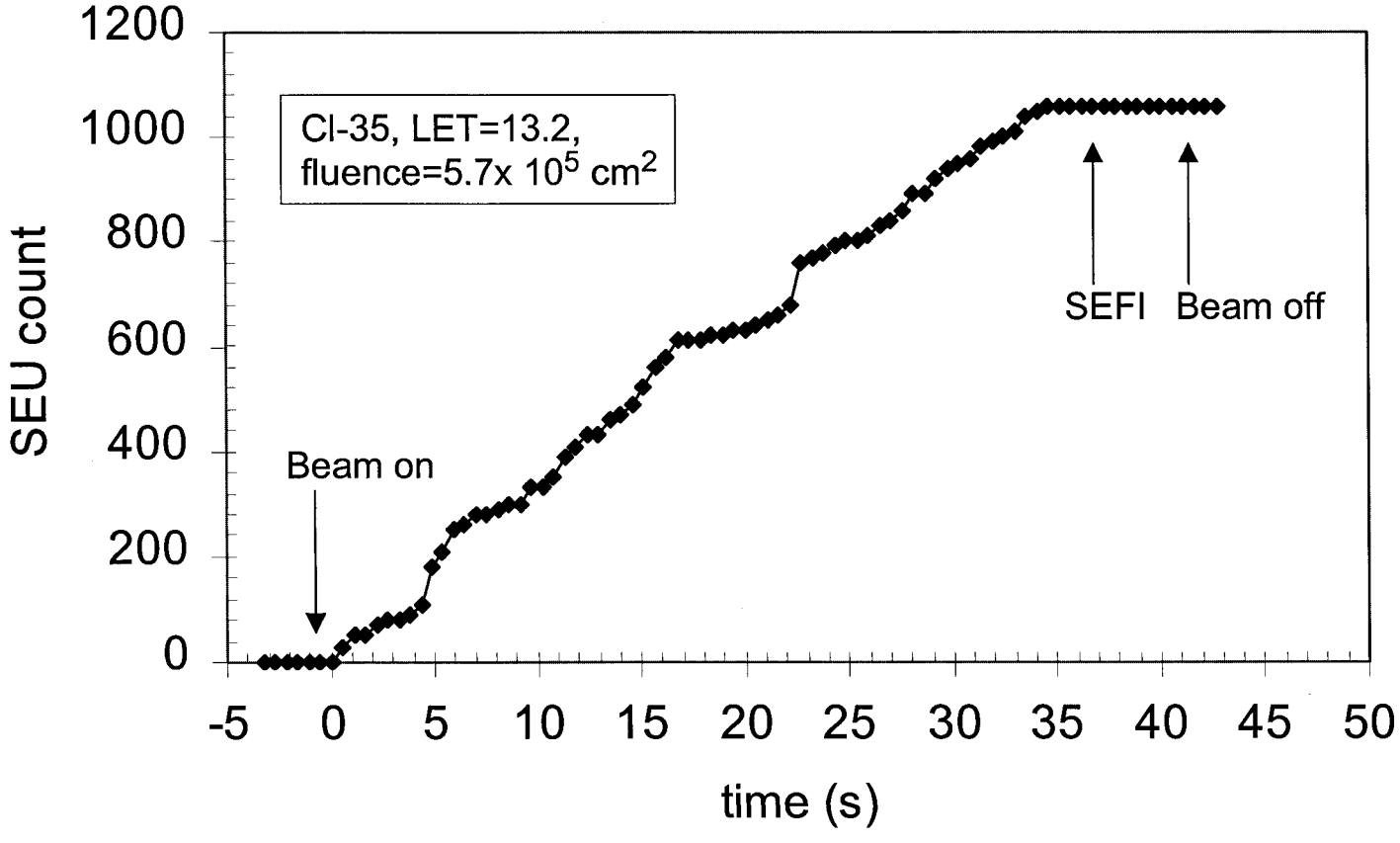
"Pin Wiggler" Self-Inspection Program



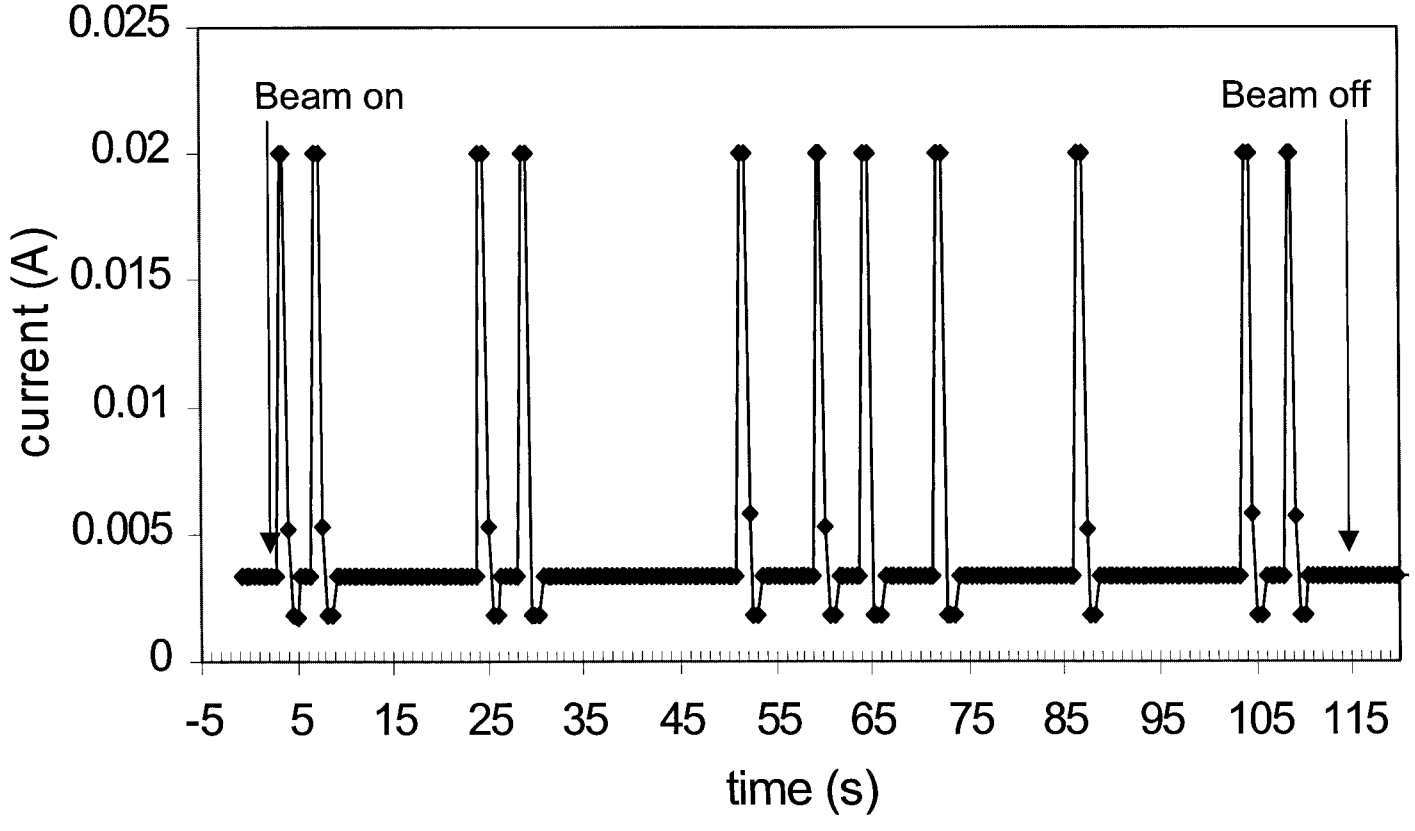
* All branches equal
* Hard-Code values
* Unroll Loops
* Fill unused program memory with: Jump To Start


PIC run #373, s/n X4127, F-19, LET=5.35
SEU count
2500
2000
1500
1000
500
0
-5
5
15
25
35
45
55
65
75
85
95
105
115
time (s)
Beam on
Beam off

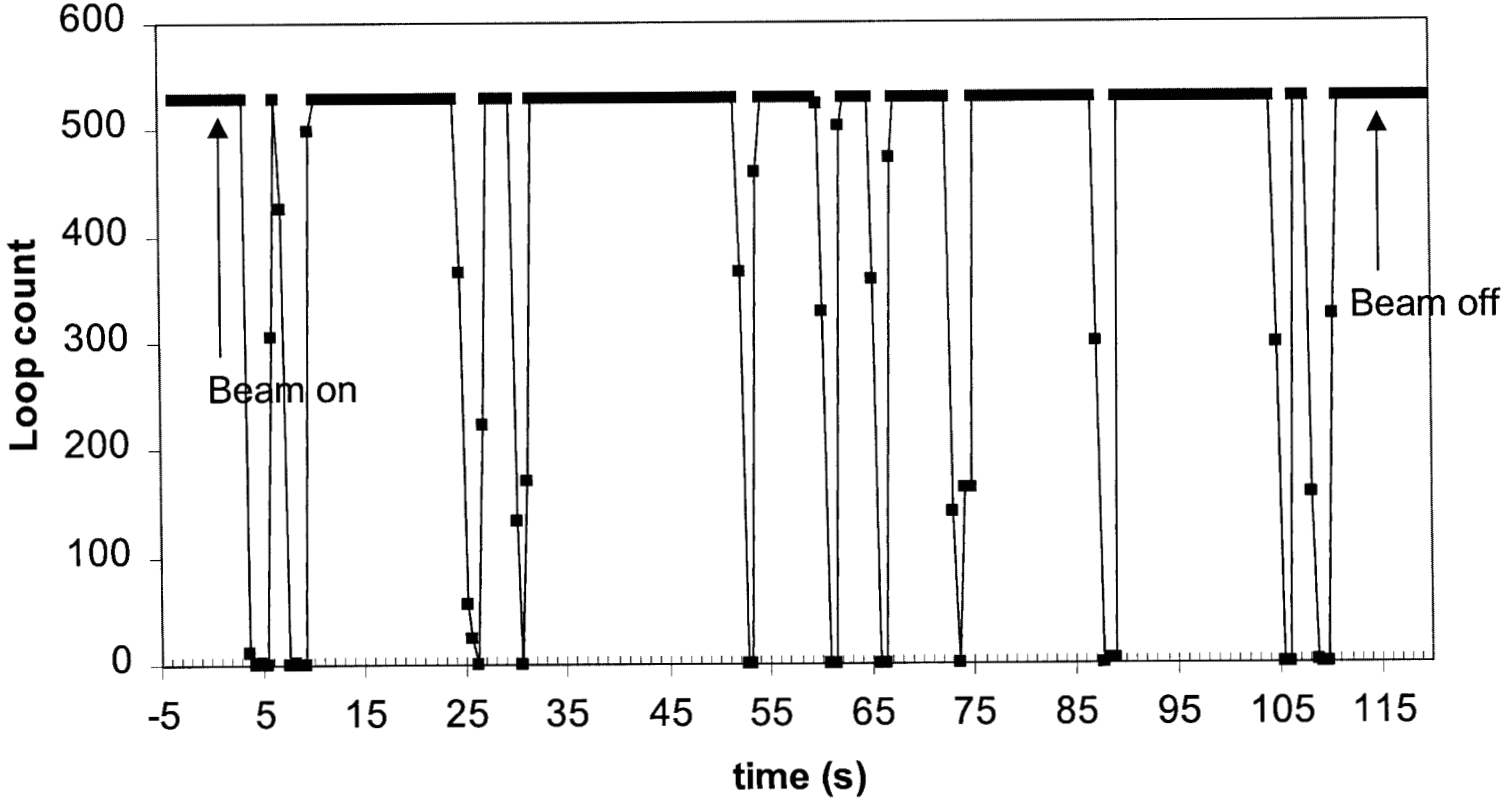
Example: PIC 16C505 (w/ SEFI)



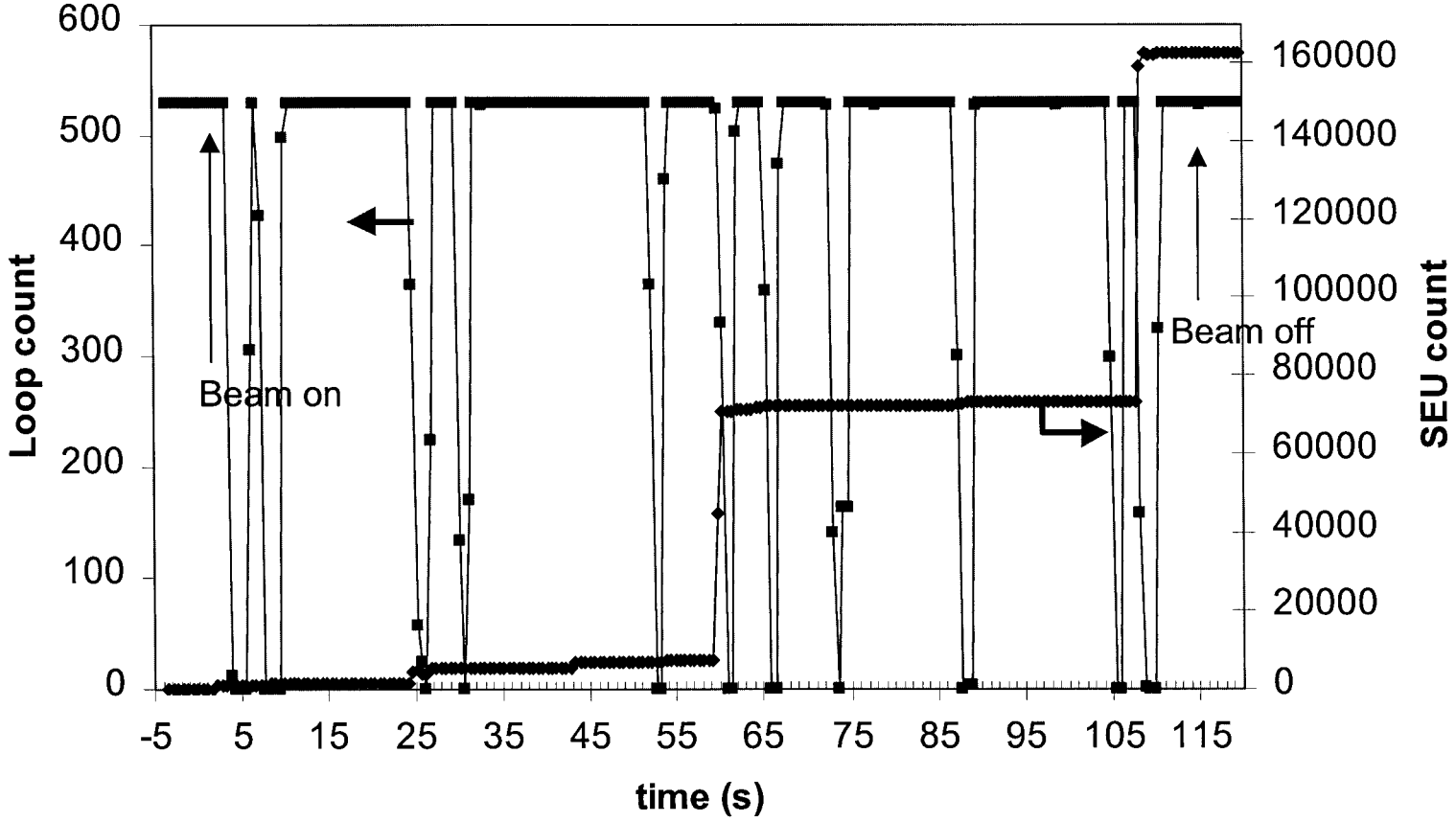
Example: AIC51 - 11 latchups



Example: AIC51 - Loop counter



Example: AIC51 - Upset results



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Conclusion

"Pin Wiggler" is:

- simple
- data rich

but has limitations of all register testing